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Programme efficiency analysis in Spanish foundation sector

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ABSTRACT

This paper evaluates the performance of the foundation sector in Spain by applying the non-parametric technique of Data Envelopment Analysis (DEA), proposed by Charnes, Cooper, and Rhodes (1978) and Banker, Charnes, and Cooper (1984). The study is based on a sample of 172 Spanish foundations, framed inside the sub-sectors of care and educational–cultural foundations, both of them relevant in the national foundation sector. In order to measure the performance of these kind of non-profit organisations, we designed a model based on the economic and financial information obtained from the annual accounts for the period 2008–2010. We classified the sample according to the different types of foundations and applied the technique known as programme decomposition approach (Charnes, Cooper, & Rhodes, 1981) to determine which foundational model achieves a better management performance. Subsequently, the work was completed with the two-stage DEA analysis to evaluate the main factors that determine the management performance of these entities for the period of study.

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Non-profit organisations; foundations; efficiency; data envelopment analysis (DEA); programme efficiency; two-stage DEA analysis

Análisis de eficiencia por programas en el sector fundacional Español

RESUMEN

El presente trabajo evalúa la eficiencia en la gestión de recursos y cumplimiento de fines del sector fundacional en España mediante la aplicación de la técnica no paramétrica del Análisis Envolvente de Datos (Data Envelopment Analysis, DEA) propuesto por Charnes, Cooper, and Rhodes (1978) y Banker, Charnes, and Cooper (1984). A partir de una muestra de 172 fundaciones estatales pertenecientes a los subsectores de fundaciones asistenciales y de educación y cultura, ambos de relevancia en el sector fundacional nacional, se diseñó un modelo de rendimiento basado en la información económico-financiera de sus cuentas anuales para el trienio 2008-2010, al que se le aplicó la técnica DEA por programas (Charnes, Cooper, & Rhodes, 1981) de acuerdo a la tipología de fundaciones, con el fin de conocer el modelo fundacional que mejor rendimiento alcanza, complementándose posteriormente el estudio con un análisis DEA en dos etapas para evaluar los principales factores determinantes del rendimiento de dichas entidades en el periodo estudiado.

PALABRAS CLAVE
Entidades sin fines lucrativos; fundaciones; eficiencia; análisis envolvente de datos (DEA); eficiencia por programas; análisis DEA en dos etapas

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1. Introduction

Measuring the management performance of any decision unit turns into a fundamental activity when we want to know if its economic resources (inputs) are being properly applied in order to achieve the production target. In this sense, and despite the fact that non-profit organisations (hereafter NPO), such as foundations, are characterised by the absence of profit and capital property, the efficient management of resources remains being one of its key objectives.

A wide range of literature (Bititci, Carrie, & Mcdevitt, 1997; Neely & Waggoner, 1998; among others) sustains that the economic and financial information provided by the accounting of such entities is enough to understand their activities, but it is precarious for measuring the performance in resource management in order to fulfil its social purposes.

In this context, in 2012 the NPO Commission of the Spanish Accounting and Business Administration Association (AECA) developed a document that includes an indicator set aimed to provide the basic information needed about the different type of NPO. In addition, this document refers to a more complex tool called Data Envelopment Analysis (DEA). This tool makes possible to obtain an integrated indicator instead of multiple individual indicators, by providing a relative efficiency measure in management for a set of entities in a productive context of multiple factors and products (Charnes et al., 1978).

The present study seeks to evaluate the management performance of 172 care and educational–cultural Spanish foundations during the period 2008–2010. Under this motivation, we applied the DEA technique to a model composed of a set of variables derived from the economic and financial information of the annual accounts. DEA methodology allows us to identify the foundations that present the best management practices, while facilitating the comparison according to the foundation kind (care foundations vs. educational–cultural foundations) (Charnes et al., 1981). In first place, this technique analyses the separated frontiers in order to determine the management efficiency (managerial efficiency), and then, the programme or group efficiency analysis (programme efficiency) for the purpose of finding the foundational model that reaches the best performance. Finally, the study is complemented by an econometric analysis that evaluates the main performance determinants in the Spanish foundations. In short, this paper seeks to obtain information that may be interesting for management decisions in foundation sector aimed to ensure the best management of available resources, in order to obtain their objectives efficiently.

The literature review shows that there is a lack in terms of providing avenues for improvement by analysing the efficiency of foundations, given the limited work around this sector. We start from how convenient is the fact that the economic and financial information produced is not only used for accountability but also to perform the tasks of internal management of foundations, identifying which factors of this kind are crucial, and therefore become pathways and strategies, whose aim it is to increase its efficiency in the achievement of social goals. In this sense, this work represents the first empirical evidence of the methodological approach proposed by Charnes et al. (1981) applied in the field of NPO, and specifically in the foundation sector, addressing a larger

sample of foundations and distinguishing between two kind of foundation, namely, care foundations and educational–cultural foundations.

Regarding the number of researchers applying DEA technique, and considering the information found in different databases (Emrouznejad & Thanassoulis, 1996, 1997; Gattoufi, Oral, & Reisman, 2004; Seiford, 1995, 1997; Tavares, 2002), we can identify over 2,500 authors that have written about 55,000 pages with an average of 2 authors for publication and 12.5 pages per paper. One of the most prolific writers is William W. Cooper, who wrote a total of 122 publications, representing a 14% of the total publications signed by the 12 most important authors in this scientific field. At this point, it must be said that DEA technique has been used in different areas for management performance evaluation, prevailing the sectors of Banking, Education and Health (Emrouznejad, Parker, & Tavares, 2008).

With regard to the conceptual framework, focusing on the works done in the field of NPO, stands out the predominance of papers based on Spanish Non-Governmental Development Organisations efficiency analysis (NGO). On the fundraising field of NGOs, we can refer to studies which analyse the efficiency. In this sense, Marcuello (1999) analyses 50 NGOs by studying the influence on efficiency by the characteristic factors of the mentioned organisations, such as size, legal form and sector, by being the main conclusions that the efficiency levels are affected positively by the size and negatively by legal form, while Martín, Hernández and Martín (2007) analyse 37 NGOs, concluding that in the efficiency organisations the interest groups receive more compensation and will not want to leave. In the same research line, García and Marcuello (2007) study 91 NGOs by analysing the relationship between efficiency and factors such as size, social linking, legal form, antiquity and funds structure, concluding that it is the only significant size variable, and therefore, it is not possible to establish a behavioural model to improve the efficiency levels. Moreover, some papers evaluate the efficiency in the achievement of social goals of NGOs. Thus, Gámez, Martin and Martin (2012) studies the relationship between efficiency and misreporting in 52 projects of NGOs, being the main conclusion that the misreporting is a common practise within the development cooperation subsector and it helps to improve efficiency levels, while Gálvez (2012) selects 225 NGOs to study the relationship between efficiency and transparency website information, concluding that a significant relationship is not displayed.

A minor number of articles have applied DEA technique in the Spanish foundation sector, probably because of the great difficulty in accessing to the data, which is a major obstacle for researchers interested in this kind of entities, assertion to which we join together with authors such as in Andrés, Azofra, and Romero (2010), García, Jiménez, Sáez, and Viaña (2004), González and Rúa (2007), Romero (2007) and Ibáñez and Benito (2013). We can only refer to the works in Romero (2007) and Martínez and Guzmán (2014), which analyse the efficiency in the achievement of social goals of foundations. The first one analyses 124 foundations and studies the relationship between efficiency and the governance mechanisms of foundations, concluding that the efficiency levels are low (about 30%), and that diversity and proactive character of the board have a positive influence on efficiency, as well as the size of the entity and the concentration of donations, opposite the organisation age, that shows a negative influence. The second paper studies 88 care foundations and analyses the relationships

between efficiency and characteristic factors as size, liquidity, debt and antiquity, concluding that the efficiency levels are also low (under 50%), and factors such as long-term debt influences positively on efficiency, while the size and antiquity have a negative effect.

In the literature review, we can see how the proposed methodological approach Charnes et al. (1981) for quantifying efficiency programme has not been applied in the NPO sector yet. However, there is empirical evidence of this approach in other sectors, as one can see in the papers presented by Ahn, Charnes and Cooper (1988), Muñiz (2001), Beltrán, Gómez and Picazo (2011), García, González and Guardiola (2010), García, Picazo and González (2011) and Gómez, Picazo and Reig (2011). In the first of them, the efficiency of the two educational ordinations LGE and LOGSE are compared, and in the last two ones this methodology is implemented for the agricultural sector. For the particular case of the social economy sector (SES), we can only observe two works: Sáez, Picazo and Llorca (2011), where efficiency programmes are confronted by entities in the social economy (cooperatives and labour companies) belonging to the Spanish construction sector, and Guzmán, Hurtado and Ramos (2013), where programme efficiency is analysed in the entities of the SES of Asturias Spanish region. Programme efficiency technique let us to differentiate from management efficiency between different programmes/groups/sectors, that means this method helps us to distinguish the good programmes which might be badly managed, from worse programmes that appear to be better because of management rather than the programme/group/sector capability (Charnes et al., 1981).

The rest of the paper is organised as follows: the Section 2 describes the situation of the foundation sector in Spain; the Section 3 presents the methodology used; the Section 4 presents the design of empirical work; the Section 5 analyses the results of the efficiency model and finally, the Section 6 presents the main conclusions of the investigation.

2. The foundation sector in Spain

Due to their nature, foundations represent one of the most suitable forms to canalise private initiatives towards the ends of general interest, being part of what is known as Third Sector. There are two approaches on this sector: the SES from Europe, which identifies the non-profit sector as a part of the Third Sector, and Anglo-Saxon approach, which conceives the non-profit sector as equivalent to the Third Sector (Martínez & Guzmán, 2014). In Spain, a foundation is a NPO that by the will of its creators, has affected its lasting heritage to achieve its general interest objectives and whose beneficiaries are generic communities of people (Law 50/2002, of Foundations).

From a quantitative point of view, the SES corresponds to a 2.47% of a gross value added in relation to 2008 gross domestic product (GDP) in Spain. The 39% of the above mentioned contribution corresponds to the NPO, which is mainly represented by associations and foundations (Monzón, 2010). That shows the significant contribution it makes to the Spanish economy.

Considering the importance of NPO in our country, the number of studies focused on that is increasing constantly. That is sustained in the latest report of the Institute for Strategic Analysis of Foundations (INAEF), whose main goal is to generate and

Table 1. Financial details of the foundation sector (millions of euros).

Variables	2008	2009	2010	2011	2012
Foundational endowment	7,240	7,810	7,611	7,603	7,404
Total assets	18,600	23,900	22,828	22,750	20,686
Total revenues	7,580	9,550	7,564	7,663	7,373
Total costs	7,600	8,520	8,180	8,295	7,939

Source: Adapted from Rubio et al. (2014).

disseminate information about the Spanish foundation sector. The report reveals that in 2012 there were 13,797 registered and non-extinguished foundations, reaching the number of the active entities about 9,000, a certainly significant figure for this kind of entities (Rubio, Sosvilla, & Méndez, 2014).

If we look at the main economic data of foundations shown in Table 1, we will be able to appreciate their relevance. The economic variables of the analysis increase between 2008 and 2009, and then start decreasing until 2012, period in which we find an average endowment of 7,404 millions of euros, total assets (TAs) of 20,686,000 euros, total revenues of 7,373 millions of euros and total costs of 7,939 millions of euros.

Another singular aspect of the foundations is the ability to generate employment, even in periods of economic crisis, as you can observe in Figure 1. With regard to this, if we compare the foundation sector with the whole of the Spanish economy, the employment in the foundation sector present a better behaviour. In spite of the fact that Spanish economy experimented decreases since the beginning of the crisis, standing out the ones that took place between 2008 and 2009 (−6.76%) and between 2012 and 2013 (−4.54%), the employment generated by foundations had a positive tendency until 2010, experimenting the following variations: +4.17% between 2008 and 2009,

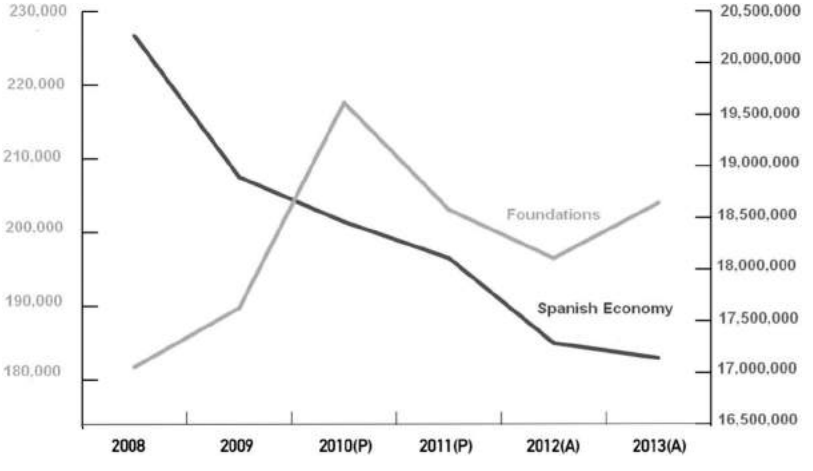

Figure 1. Employment trends in Spanish Economy and Spanish Foundation Sector. Source: Rubio et al. (2014).
Notes: Left scale for employment of foundations and right scale for employment of Spanish economy. (P) Provisional estimate. (A) Advance.

Table 2. Foundation human resources: types and basic data.

Concepts		2008	2009	2010	2011	2012
Paid staff	Direct	181,547	189,773	217,623	203,122	196,551
	Indirect	16,763	10,086	10,199	10,305	10,086
Unpaid staff	Volunteers	97,340	140,336	117,636	113,184	108,480
	Board members	77,872	80,192	78,424	75,456	72,320

Source: Adapted from Rubio et al. (2014).

Table 3. Ranking of protectorates by number of foundations.

Protectorate/Registry	2008	2009	2010	2011	2012
1º Ministry of Education, Culture and Sports	909	979	1,700	1,771	1,736
2º Ministry of Health, Social Services and Equality	834	885	923	796	780
3º Ministry of Agriculture, Food and Environment	67	72	76	77	80
4º Ministry of Employment and Social Security	42	42	31	31	30
5º Ministry of Industry, Energy and Tourism	20	22	20	20	18
6º Ministry of Development	4	5	6	8	8

Source: Adapted from Rubio et al. (2014).

+14.68% between 2009 and 2010. However, it decreased between 2010 and 2011 (−6.66%) and between 2011 and 2012 (−3.24%), recovering its positive trend in 2012.

Based on the previous analysis, we also consider interesting to know the quantitative impact generated by the employment in the foundation sector, from the perspective of the structure of human resources and direct employment creation (Table 2).

According to the Table 2, in all the periods analysed, the paid staff represent about the 53% of human resources, except in 2009 when it drops to 47.5%. Also, it can be seen that for all the period of study, volunteers represent around 60% of the group of unpaid staff.

We must highlight that this paper focuses on the study of the private state foundations in Spain. In this sense, it is important to know that there are different protectorates that are dependent of various ministerial departments. The belonging of the foundations to one or another of them is based on their activities and purposes. The Table 3 shows the ranking of Spanish state protectorates according to the number of entities, standing out that Educational, Cultural and Sports Ministry and the Ministry of Health, Social Services and Equality are the two main protectorates as for the number of foundations in Spain.

3. Methodology

3.1. *Efficiency measurement: the data envelopment analysis*

The concept of efficiency is used to evaluate the level of performance that can be achieved by a decision-making unit (DMU) with regard to its production possibilities and according to the existing technology. There are two types of approaches that can be used for the efficiency measurement: parametric and nonparametric (Parkan, 2002). In the parametric approach, we assume a priori that the production function has a specific functional form. Econometric techniques are being used for estimating its parameters according to the data provided by DMUs evaluated (Coelli, Prasada, & Battese, 1998). The non-parametric approximation evaluates the properties that must be satisfied by

the whole set of production possibilities, from which is built the so-called efficiency frontier or best practices frontier, which is integrated by the DMUs that are rated as efficient (Thanassoulis, 2001).

In this paper, in order to develop the efficiency analysis, we will adopt a deterministic non-parametric approach proposed by Charnes et al. (1978), called DEA. Using this technique we will be are able to obtain a multidimensional ratio or synthetic indicator of relative efficiency, providing a ranking of scores based on the layout of "best practice frontiers" using the data supplied by the production process, and without being necessary the prior knowledge of the functional form of the production function. The above described methodology is particularly interesting for analysing the performance of entities that present difficulties when it comes to valuating their outputs, as is the case of foundations. Also, it allows establishing a ranking based on the achieved performance that is not provided by other methodological approaches. This ranking concedes the possibility to identify the most efficient organisational designs.

Farrell (1957) defined a linear programming problem capable to build the efficiency frontier under the assumption of constant returns to scale (CCR model), assuming input or output orientation. The *input oriented* model contracts the inputs as far as possible, keeping constant its proportions of outputs, while the *output oriented* model determines the maximum expansion of outputs from a given level of consumption of inputs. The mathematical formulation of input oriented CCR model is expressed as follows:

$$\mathrm{ET}_{\mathrm{CCR}} = \mathrm{Min}.\theta_z \tag{1}$$

s.t.:

$$\sum_{j=1}^{n} \lambda_j X_{ij} + S^o = \theta_z X_{iz} \; i = 1, \ldots, m \tag{2}$$

$$\sum_{j=1}^{n} \lambda_j Y_{rj} - S^i = Y_{rz} \; r = 1, \ldots, p \tag{3}$$

$$\theta_z \geq 0; \lambda_j \geq 0 \; j = 1, \ldots, n, \tag{4}$$

where the matrices (X) e (Y) are equal to the quantities of inputs and outputs consumed and produced by DMU j, representing the variable (λ_j) the weight of each DMU in the sample that have been evaluated for the construction of the virtual unit reference that can be obtained by linear combination of other DMUs. If the above referred virtual unit cannot be achieved, then the DMU z for which the problem is going to be solved, will be considered efficient.

Solving the formulation exhibited in (1)–(4) for each DMU, we will obtain the value of the scalar (θ_z), that corresponds to the maximum radial reduction in the consumption of all the inputs of the evaluated unit. The range of this scalar fluctuates between 0 and 1, so a DMU is considered efficient if its index is equal to unity [in the case of assuming the output, the scale to determine (ψ_z) represents the largest radial expansion of all the outputs produced by the unit that is being evaluated, varying its range from 1

to ∞ and its technical efficiency score (δ_z) with a range between 0 and 1, being given by the inverse of the value of the scalar (ψ_z) ($\delta_z = 1/\psi_z$)].

The variables ($S°$) y (S^i) included in the constraints (2) and (3) are slacks of the model, that mathematically allow to eliminate inequalities that were set out originally, contributing in that way from a production point of view to record the variation of inputs/outputs of a particular inefficient DMU, regardless the radial variation of factors/products required by the intensity factor (θ_z).

Since the CCR model considers the hypothesis of constant returns to scale, and in order to avoid the difficulties associated to the efficiency measurement based on the distorted units caused by scale inefficiencies, Banker et al. (1984) proposed an alternative model (BCC model) that introduces the hypothesis of variable returns to scale by adding the constraint ($\sum_{j=1}^{n} \lambda_j = 1$) to the CCR model. Thus, the mentioned BCC model allows to calculate the scores of *pure technical efficiency* (ET_{BCC}) considering the scale of operations of efficient entities regarding the DMU that is being evaluated.

If we compare the production plan of a given DMU situated on the efficiency frontier of BCC and CCR models, we can determine the *scale efficiency* (SE) according to the mathematical formulation exhibited in (5)–(6), where a value inferior to unity (SE <1) reveals the existence of inefficiency caused by a non-optimised production scale:

$$SE = \frac{ET_{CCR}}{ET_{BCC}} \tag{5}$$

$$ET_{CCR} = ET_{BCC} \times SE, \tag{6}$$

where:

TE_{CCR}: Global Technical Efficiency.
TE_{BCC}: Pure Technical Efficiency.
SE = 1: Scale Efficiency.
SE<1: Scale Inefficiency.

Finally, we must point out that the discrimination power of the DEA technique is consistent with the number of variables that are integrated in the efficiency model. In relation to a total number of evaluated units *n*, this last one parameter has to be at least three times the sum of the inputs and outputs included in the performance model (El-Mahgary & Lahdelma, 1995).

3.2. *Measuring programme efficiency*

Charnes et al. (1981) were the first to propose the method known as programme or group efficiency, distinguishing the following concepts of efficiency:

- *Managerial or intra-programme efficiency*, which evaluates the performance of a given DMU in relation to the "best practice frontier" within its group, and
- *Programme or inter-programme efficiency*, able to identify performance differences between the existing programmes/groups/sectors that are exclusively attributed to

the idiosyncrasy or nature of its productive action, which in our study highlights because of the different nature of combination of inputs and outputs in both groups identified: care and educational–cultural foundations.

Assuming the programme efficiency methodology, we should consider the following steps for its estimation:

(a) The sample must be divided into groups or programmes, applying to each of them, separately, the formulation shown in (1)–(4) for the efficiency levels of management (or intra-programme managerial efficiency).
(b) According to the results of managerial efficiency obtained in step (a), the DMUs that turn out to be inefficient, must be projected on their efficiency frontiers to eliminate management inefficiencies caused by decisions taken by the direction. Due to this, the original production data will need to be corrected using the formulation shown in (7)–(8):

$$x'_{iz} = \theta x_{iz} - S_{iz}^{-} \tag{7}$$

$$y_r = y_{rz} + S^{+}{}_{rz}, \tag{8}$$

where (x'_{iz}, y'_{rz}) represent the values that are present on the frontier of the outputs and inputs of the evaluated DMU z, being (x_{iz}, y_{rz}) the original data of the production process, while the scalar (θ_z) and slacks $(S^{-}{}_{iz})$ and $(S^{+}{}_{rz})$ will proceed from the solution of the linear programming model proposed in (1)–(4).

(c) Taking the 'corrected' production data obtained in step (b), exempt from management inefficiencies, again we will calculate the efficiency scores using the formulation shown in (1)–(4). However, in this case, we will lay out only one efficiency frontier for the whole the sample, allowing the calculation of the efficiency programme levels, thereby facilitating comparison of the performance of the DMUs belonging to each of the groups (or programs) evaluated.
(d) Finally, to assess whether there are statistically significant differences in the performance of the analysed programmes, we will need to apply the appropriate statistical test.

3.3. *Two-stage DEA analysis*

3.3.1. *Proposed regression model*

The econometric study known as two stage DEA analysis (Puig-Junoy, 2000; Trillas, Montolio, & Duch, 2011) was carried out to assess the main determinants of the foundation performance. The dependent variable of the study is the management efficiency scores (BCC model).

However, the singularity of that variable (efficiency scores), which takes the value 1 when the unit is efficient and values between 0 and 1 when it is not, complicates the choice of the econometric analysis method. Thus, from a statistical point of view, there is a certain similarity between the distribution of efficiency scores and censored

regression models. For this reason, a significant number of articles use Tobit regression as a method of estimating for examining exogenous variables that affect the above mentioned performance levels. Nevertheless, it is difficult to assume that the distribution of the dependent variable – efficiency scores fits exactly the censored regression theory, since the accumulation of values in the highest level of efficiency is not the result of a defect in data, but the consequence of the definition of the problem, and also, in occasions, it is not possible to assume the condition of normality of the variable required by Tobit regression (Chilingerian, 1995; González & Barber, 1996).

For the above stated reasons, in this paper the econometric analysis of DEA in two stages was carried out using a more appropriate alternative methodology called *logit regression*, consisting of a model with dichotomous dependent variable. It is a multivariate technique able to describe the relationship between a set of explanatory metric or categorical variables in relation to a binary-dependent variable, which only takes two values to specify whether the analysed individual has a particular characteristic studied that is mutually exclusive. In our study, the dichotomous-dependent variable will take value 1 if the evaluated foundation is efficient and 0 if it is not, so the probability of the event (be efficient) to occur varies between 0 and 1 (Sánchez, 2000).

An additional issue to consider is the possibility of applying the logistic regression model with panel data, that allows combining information from various individuals in a particular time (cross section) during several periods of time, or with pooled sample of the observations for all the available periods (pooled sample). This issue can be solved by applying the *Breusch–Pagan Test* or *Lagrange Multiplier* (Breusch & Pagan, 1980), which considers as a null hypothesis the application of logit regression model on the pooled sample, whose rejection (p-value <0,05) involves the selection of the regression model with panel data.

The methodological statements lead us to indicate that the national and international literature written about NPO, mainly, is focused on NGOs, with just a few papers about the foundations available. Besides, not all the existing studies measure efficiency through DEA technique, such as González and Rúa (2007) and Golden, Brockett, Betak, Smith and Cooper (2012), who use efficiency ratios even acknowledging their limitations, and when they apply DEA they use the Tobit censored regression model, despite the limitations of this analysis that have been mentioned previously (Andrés et al., 2010; Gálvez, 2012; García & Marcuello, 2007; Marcuello, 1999; Drake & Simper, 2003; Romero, 2007). That means that the econometric model used in this analysis differs from other methodological approaches used by other authors.

3.3.2. *Hypotheses to be tested*

It is important to know the efficiency of organisations, but it is necessary to advance in the knowledge of the factors that affect it also (Gálvez, 2012). According to the literature in two-stage DEA analysis previously studied, we could highlight as the main factors, the size of the organisation, the antiquity, the legal form and different characteristic factors of the organisations. Based on the literature and the information available, in the present study we raised some hypothesis in order to test them on the representative samples for both types of foundations by applying the logit regression model.

- *Hypothesis 1: Positive relationship between the size of paid workforce and efficiency*: Entities, whose main activity is the provision of services of general interest to people, as is the case of social organisations such as care and educational–cultural foundations, are characterised for being intensive in staff to be able to attend to as many users as possible (Ibáñez & Benito, 2013). For that reason, and as another studies raised above (Andrés, Martín, & Romero, 2006; González & Rúa, 2007), we expect a positive relationship between the number of paid staff (WPS) and the level of efficiency in foundations.
- *Hypothesis 2: Negative relationship between antiquity and efficiency*: In general the antiquity of a foundation (AN) means a greater prestige and experience gained over time, and a signal that has been a well-managed organisation and for that it persists over the time. These are the reasons that papers such as Andrés et al. (2006), González and Rúa (2007), Martín et al. (2007), Martínez and Guzmán (2014) and Romero (2007) pose a positive relationship between the antiquity of an entity (measured by the number of years since its establishment) and its level of efficiency. However, the results of these studies indicate otherwise, probably because the oldest organisations have no ability to adapt to changing situations, new technologies and to assume the professionalism as the younger ones (Martínez & Guzmán, 2014; Romero, 2007). In the study we will check whether the negative relationship reaffirms.
- *Hypothesis 3: Positive relationship between foundational endowment and efficiency*: The contribution of the founder may be another explanatory factor of efficiency. González and Rúa (2007) and Martínez and Guzmán (2014) indicate that a higher level of foundational contributions (END) results in a strengthening of the permanent capital of the entity, and leads to greater oversight of the proper allocation of resources that have been provided by the founders, and for this reason, this paper presumes a positive relationship between the efficiency and the financial stability.
- *Hypothesis 4: Negative relationship between surplus and efficiency*: Although foundations are defined as non-profit organisations, we must be aware about the impact of surplus (SURP) in their management, since this variable allows us to detect and measure if foundations have balanced budgets. González and Rúa (2007) established that a surplus in that kind of organisations means they have not been invested in foundations activities, which could show that the entity could have made more performances with available resources than actually made. Therefore, it can be assumed as a negative relationship between surplus and efficiency.
- *Hypothesis 5: Positive relationship between the number of volunteers and efficiency*: The volunteer staff (VOL) corresponds to human capital that the entity receives without any monetary consideration. That is an interesting factor that certainly influences foundation's performance. For this reason, and as Andrés et al. (2006) and Ibáñez and Benito (2013) note in their studies, we presume a positive relationship between the efficiency and the presence of the volunteers.
- *Hypothesis 6: Negative relationship between governing structure size and efficiency*: The governing structure of a foundation consists of the board, and its members are responsible for the coordination and decision-making (GOV). Studies as Andrés

et al. (2006), Andrés et al. (2010) and Marcuello (1999) consider that the presence of a large body of government could lead to a less efficient management, because it causes problems of communication, coordination and decision-making that leads to less efficiency management. In this sense, the expected relationship between the size of board and the efficiency is negative.

4. Sample and variables

4.1. *Selected sample*

From the financial information provided by the INAEF together with other relevant data, it was possible to select a sample of 172 care and educational–cultural foundations [the two top protectorates in the ranking of number of foundations showed in Table 3 for period 2008–2010 (Table 4)]. Superefficiency model (Andersen & Petersen, 1993) was applied to both samples separately to identify the outliers DMUs.

4.2. *Efficiency model variables*

According to the literature and the idiosyncrasy of foundations, the variables of the efficiency model selected should represent the production process of the organisation (García & Marcuello, 2007). For this reason, it is necessary to know which are the main resources of the organisation (inputs) and the results (outputs) from the financial and no financial information available (Epstein & McFarlan, 2011).

Considering the literature review previously cited, we could observe DEA technique had been used to measure the efficiency in the achievement of social goals and in fundraising, being more focused on the first one in the foundational sector. In this sense, the present study analyses the efficiency in achieving social purposes to both type of foundation panels (care and educational–cultural). Table 5 includes the variables of the efficiency model applied under the perspective of the input orientation (Pastor, 1995), since the objectives of the research are focused on minimising the inputs used to satisfy the needs of the beneficiaries of these entities (Gámez et al., 2012). These variables represent the production process of care and educational–cultural foundations as follows justify.

The *output* selected for the efficiency model was the number of individuals who have been final and direct beneficiaries of the general interest activities carried out by foundations during the year, since as Ibáñez and Benito (2013) affirm, it is one of the most relevant information for the purpose of studying the efficiency of foundations, and it is one of the key indicators of the social impact of the sector (Gálvez, 2012; Gámez et al., 2012; Ibáñez & Benito, 2013; Martínez & Guzmán, 2014; Rey & Álvarez, 2011). In

Table 4. Foundation's distribution in the sample.

Type of foundation	Sample size	Time frame
Care (A Panel)	80	2008–2010
Educational–Cultural (B Panel)	92	
Total	172	

Source: compiled by the authors

Table 5. Variables of the efficiency model.

Output:
– Number of direct beneficiaries (NB)
Inputs:
– Staff Costs (SC)
– Grants, donations and bequests (GDB)
– Internally generated revenues (IGR)
– Total Asset (TA)

Source: compiled by the authors.

fact, it is mandatory to publish that information in the annual report of the organisation for evaluating the performance of its activities (Galindo, Rubio, & Sosvilla, 2012). However, this information has not been offered by many of the foundations in the time frame analysed, what it has damaged the sample size.

In terms of *inputs*, we considered the fundamental variables that make up the main resources of foundations, such as staff costs (SC); revenue grants, donations and bequests (GDB); internally generated revenue (IGR) and TAs.

Regarding the SC, it is undisputable that human factor, that in our performance model was determined according to the costs that represented in the results of the foundation, is a basic input for the development of the projects of an entity. Besides, this input is generally considered in a non-profit sector to design efficiency models (Drake & Simper, 2002, 2003; Gálvez, 2012; Gámez et al., 2012; Romero, 2007).

As for the input of managed income, we took into consideration both: the externally generated incomes represented by revenue GDB, and the IGR, basically composed of membership fees, sponsors, partnerships, economic activities, management and financial accessories. The two types of income are crucial for determining the number of services that the entity can provide, since, as we already know, there is a wide range of actions that can be performed, while the financial resources are limited (Hernangómez, Martín, & Martín, 2009). Moreover, the variable income, just like the variable SC, is also regularly used in building performance models within the scope of the non-profit sector (Gálvez, 2012; Marcuello, 1999; Romero, 2007).

Finally, to complete the efficiency model, we considered it appropriate to include as input the TA reflected in the balance sheet, as the basic support for the development of the foundational activity. This variable, just like the above mentioned ones, has been also used in previous studies (Romero, 2007).

The descriptive statistics of the efficiency model variables for 2008–2010 are shown in Table 6 for both foundations panels.

4.3. *Variables for the model selected in two-stage DEA*

According to the hypotheses raised in the Section 3.3, the two-stage DEA was based on the explanatory variables included in Table 7. As stated before, as the dependent variables were used the efficiency scores obtained from BCC model, that provide levels of pure technical efficiency (ET_{BCC}) under the assumption of variable returns to scale.

Table 6. Descriptive statistics of the variables in the efficiency model (millions of €).

Year	Statistical	NB	SC	GDB	IGR	TA
A Panel: Care foundations ($N = 80$)						
2008	Average	84,940	1,421,642	2,229,340	1,160,417	5,064,521
	Median	318	527,925	521,243	278,488	1,228,662
	Standard dev.	694,970	3,524,738	6,705,516	3,077,540	13,606,464
2009	Average	103,990	1,546,848	2,246,199	1,174,048	5,433,372
	Median	369	592,289	622,754	336,296	1,384,154
	Standard dev.	838,127	3,757,754	5,894,506	2,722,002	13,869,486
2010	Average	102,316	1,639,621	2,630,379	1,344,369	7,671,466
	Median	406	589,492	650,971	322,112	1,489,197
	Standard dev.	766,661	4,038,614	6,637,229	3,038,784	22,417,920
B Panel: Educational–cultural foundations ($N = 92$)						
2008	Average	67,592	786,944	2,454,577	707,235	7,321,726
	Median	621	201,762	545,887	105,399	734,755
	Standard dev.	328,991	1,404,351	4,246,534	1,663,561	15,453,541
2009	Average	69,245	884,514	2,828,699	767,617	8,234,318
	Median	740	210,751	702,584	125,682	809,651
	Standard dev.	312,434	1,590,320	5,691,466	1,747,840	20,140,592
2010	Average	95,338	1,005,242	2,653,026	720,716	9,135,430
	Median	837	224,034	714,157	130,278	868,565
	Standard dev.	479,356	2,081,870	4,589,157	1,615,543	20,906,167

Source: compiled by the authors

NB: number of beneficiaries; SC: staff costs; GDB: grants, donations and bequests; IGR: internally generated revenues; TA: total assets.

Table 7. Explanatory efficiency variables for foundations.

- *Paid Workforce (WPS)*: number of paid workers.
- *Antiquity (AN)*: number of years since the establishment of the foundation.
- *Foundational endowment (END)*: foundational endowment presented in the balance sheet.
- *Surplus (SURP)*: Annual surplus of foundation.
- *Number of volunteers (VOL)*: number of volunteers in the foundation.
- *Governing structure (GOV)*: The size of the foundation governing structure.

Source: compiled by the authors.

5. Results

5.1. *Measure of managerial efficiency (intra-programme efficiency)*

The efficiency model (phase a) was solved using the methodology proposed for the programme decomposition approach to efficiency, separating the foundations of the sample into two groups, according to the typology: care foundations vs. educational–cultural foundations.

Table 8 shows the results of intra-efficiency, revealing that, for the 3-year period analysed, the average level of pure technical efficiency for the care foundations (Panel A) is higher than the one of educational–cultural foundations (Panel B) (0.295 vs. 0.274). These findings indicate that, on average, educational–cultural foundations must reduce its inputs by 72.6%, while the care foundations must do it by 70.5%. However, the inefficiency of scale in care foundations is 5.9% higher than in educational–cultural foundations, which reflects a better scale of operations of the last ones.

Table 8. Intra-efficiency scores.

	CCR model		BCC model		Scale efficiency	
Period	Average	Stand. dev.	Average	Stand. dev.	Average	Stand. dev.
A Panel: Care foundations						
2008	0,104	0,269	0,237	0,351	0,294	0,360
2009	0,096	0,258	0,342	0,359	0,199	0,327
2010	0,102	0,272	0,305	0,337	0,207	0,336
Annual average	**0.100**	**0.266**	**0.295**	**0.349**	**0.233**	**0.341**
B Panel: Educational–cultural foundations						
2008	0,115	0,267	0,290	0,369	0,291	0,371
2009	0,118	0,269	0,281	0,363	0,305	0,376
2010	0.094	0.234	0.251	0.342	0.281	0.362
Annual average	**0.109**	**0.256**	**0.274**	**0.358**	**0.292**	**0.369**

Source: compiled by the authors.

Focusing on the pure technical efficiency results (BCC model), we can obtain more information from DEA results with the aim of deepening the differences of both models of foundations. In each model, the foundations number that form the efficiency frontier represent between 11–16% of the total of organisations, while the volume of output generated by these foundations with respect to the total represent about 90% in care foundations and about 50% in educational–cultural ones.

As for the individual influence of production factors implemented in the performance model, the TA is the variable most influential input in both models, and in educational–cultural foundations that input presents major added inefficiency (5–13%) than the rest of variables, however in care foundations the added inefficiency are similar in all the inputs and lower than in educational–cultural foundations.

5.2. *Measure of programme efficiency (inter-programme efficiency)*

From the results of the intra-group efficiency (Table 8), we eliminated management inefficiencies (phase b) and, subsequently, the programme efficiency scores (phase c) were calculated (Table 9), pointing out that, on average annual values, the performance of educational–cultural foundations present higher levels (BCC Model: 0.994 *vs*. 0.517; CCR Model: 0.298 *vs*. 0.192).

Table 9. Inter-efficiency scores.

	CCR model		BCC model		Scale efficiency	
Period	Average	Stand. dev.	Average	Stand. dev.	Average	Stand. dev.
A Panel: Care foundations						
2008	0.181	0.268	0.826	0.226	0.247	0.329
2009	0.167	0.310	0.331	0.278	0.291	0.370
2010	0.228	0.273	0.394	0.296	0.424	0.311
Annual average	**0.192**	**0.283**	**0.517**	**0.266**	**0.320**	**0.336**
B Panel: Educational–cultural foundations						
2008	0.280	0.351	0.993	0.063	0.287	0.358
2009	0.329	0.361	0.992	0.065	0.335	0.366
2010	0.286	0.350	0.997	0.018	0.288	0.352
Annual average	**0.298**	**0.354**	**0.994**	**0.048**	**0.303**	**0.358**

Source: compiled by the authors.

Table 10. *T*-test about average differences for efficiency levels by programmes.

	Care foundations		Educational–cultural foundations			
Period	Average	Stand. dev.	Average	Stand. dev.	T stad.	*P*-value
***T*-test of pure technique efficiency (BBC model)**						
2008	0.826	0.226	0.993	0.063	−6.774	0.000***
2009	0.331	0.278	0.992	0.065	−22.147	0.000***
2010	0.394	0.296	0.997	0.018	−19.552	0.000***
Pooled S.	0.517	0.266	0.994	0.048	−22.588	0.000***
***T*-test of global technique efficiency (CCR model)**						
2008	0.181	0.268	0.280	0.351	−2.063	0.041**
2009	0.167	0.310	0.329	0.361	−3.125	0.002***
2010	0.228	0.273	0.286	0.350	−1.190	0.236
Pooled S.	0.192	0.283	0.298	0.354	−3.724	0.000***

Source: compiled by the authors.
*significant at 10%; ** significant at 5%; *** significant at 1%.

According to the results of Table 10, that contains the mean difference test (*step d*), the performance of the two groups of foundations is statistically significant in both: the BCC model and the CCR model. Consequently, it can be stated that the educational–cultural foundation model is preferable to the care foundation model, due to its ability to get a better perform.

This is an empirical evidence of the methodological approach proposed by Charnes et al. (1981), where the results could be different if we only consider managerial efficiency or introduce programme efficiency also. For that reason, it is necessary to differentiate managerial efficiency than programme efficiency, because in many researches we need to distinguish good programmes/groups/sectors, which might be badly managed, from worse programmes that appear to be better because of management rather than programme/group/sector capability.

5.3. *Two-stage DEA analysis*

Once managerial efficiency and programme efficiency was assessed, it is interesting to analyse which factors could be determinant of managerial efficiency in order to detect how foundations could improve it. On the basis of the proposed methodology (Section 3.3), we applied, separately for both groups of foundations, a logit regression model in order to understand the determinants of efficiency based on the covariates listed in Table 7 for each model of foundations.

The choice of the regression model was justified applying the Breusch–Pagan test to both foundational sectors (care foundations: Chi(2): 0.82, *p*-value: 0.3641; educational–cultural foundations: Chi(2): 0.76, *p*-value: 0.3847). The results the Breusch–Pagan test justify the decision of using pooled sample in both groups of foundations for the regression model, instead of the nested regression (Table 11). Also, a sensitivity analysis for both logit regression models proposed was performed by considering the foundation scores at or above 0.95 was efficient.

If we focus on the nature of foundations, we will observe that only two of the six analysed explanatory variables are significant in both types of them. These variables are: the paid workforce (WPS) and the number of volunteers in the foundation (VOL), presenting a negative and positive coefficient respectively (1% in care and 5%

Table 11. Logit regression model estimation for pooled sample.

Logit Model: $DEA_{it} = \rho_0 + \rho_1 WPS_{it} + \rho_2 AN_{it} + \rho_3 END_{it} + \rho_4 SURP_{it} + \rho_5 VOL_{it} + \rho_6 GOV_{it} + u_{it}$							
Intercept	WPS	AN	END	SURP	VOL	GOV	Pseudo R^2
A Panel: Care foundations							
1,965	−0.071***	−0.171***	1.11e-07**	−2.17e-06***	0.007***	−0.182**	0.4613
(2,48)	(−2.97)	(−3.53)	(2.13)	(−3.08)	(3.91)	(2.06)	
B Panel: Educational–cultural foundations							
−0,639	−0.049**	0.004	−1.19e-06	4.61e-08	0.002**	−0.044	0.2357
(−1,32)	(−2.41)	(0.19)	(−1.47)	(0.23)	(2.26)	(−0.91)	

Source: compiled by the authors

DEA_{it}: Dummy variable foundation *i* for period t with value (1) if foundation is efficient in BCC model; or value (0) otherwise; *WPS_{it}*: total number of workforce paid staff of foundation *i* for period *t; AN_{it}*: number of years since the foundation *i* for period *t; END_{it}*: foundational endowment presented in the balance sheet of foundation *i* for period *t; $SURP_{it}$*: Annual surplus of foundation *i* for period *t; VOL_{it}*: number of volunteers of foundation *i* for period *t; GOV_{it}*: The size of the governing structure of foundation *i* for period *t*. Figures in parentheses indicate the statistical *t*-value. *, **, *** Statistical significance at 10%, 5% y 1%, respectively.

in educational–cultural foundations), which implies that the probability of being between organisations with a better management decreases when there is an increase in the size of the paid workforce, which does not confirm our hypotheses, and conversely, it grows with the increase of the volume of volunteers, that confirms our hypotheses.

Besides, the study shows that for the particular case of care foundations, the rest of the variables are significant. Thus, the variables antiquity (AN), surplus (SURP) and size of governing structure (GOV) show negative coefficients (1% in AN and SURP, and 5% in GOV), which confirm our hypotheses and means that the increase of the number of years since the establishment of the foundation, the increase of the surplus or of the number of people who make up its governing body, decreases the probability of the company to be classified as efficient. In contrast, the coefficients of the variable endowment (END) are positive and significant (5%), denoting this fact that a care foundation that increases its endowment fund, increases the probability of being among the better management foundations, that confirms our hypotheses.

6. Conclusions

The present article evaluates the management performance of care and educational–cultural foundations for the period 2008–2010, applying the non-parametric technique of DEA in order to determine the efficient frontiers, differentiating between managerial efficiency and programme efficiency, and complementing the research with a two-stage DEA analysis for estimating the determinants of the management efficiency in this kind of organisations.

The main findings of the research indicate for the efficiency models proposed assuming variable returns to scale (BCC Model), that care foundations present, on average, higher levels of managerial efficiency (intra-efficiency) than educational–cultural foundations (pure technical efficiency 0.295 vs. 0.274). However, once the management inefficiencies were eliminated, educational–cultural foundations showed a more adequate input/output combination than care foundations (pure technical efficiency 0.994 vs. 0.517). This means that educational–cultural foundations should be more efficient by the idiosyncrasy or nature of their productive action than care foundations,

however the management efficiency in care foundations is being more appropriate, and therefore it appears to be better because of management rather than performance capability of that kind of foundations.

When both foundations models are compared, it can observe that the educational–cultural foundations should pay more attention to the management of its assets (AT), since the mentioned variable has an important bearing on the foundation models analysed, being in the education foundations the input that presents more added inefficiency, which involves a negative consequences on its management efficiency.

Moreover, in the care foundations model draws attention as the most efficient entities that form the efficiency frontier, which represent between 11–16% of the total number of care foundations, are able to attend a very high percentage of beneficiaries, which highlights the great imbalance in management efficiency between these kind of foundations. A similar situation happens in educational–cultural foundations, but not as drastic, because the most efficient foundations, which are represented by a similar proportion as in care ones, only are able to serve about half of the total beneficiaries.

In short, the foundations analysed have a similar production process and a common goal which is to provide social services to its beneficiaries in care sector and in educational–cultural sector, but as we can observe, these entities have differences in performance capability by nature, in management of resources and in how they combine inputs and outputs.

To complete the previous study on the management and programme efficiency, we analyse the main determinant factors of the management efficiency in each kind of foundation. In this sense, the results of two-stage DEA analysis reveal that the variables related to the size of the paid workforce affect negatively the performance of foundations, while the number of volunteers has a positive impact. This implies that the probability of being between the organisations with a better management decreases when there is an increase in the size of the paid workforce and, conversely, it grows with the increase of the volume of volunteers.

The above results invite us to think that care and educational–cultural foundations should study and restructure the human resources, because of a main factor in their activities, since the service that these entities provide depends largely on staff in both kinds of foundations. Probably, the negative effect of the paid staff in management efficiency is due to that resource is a main cost to the organisations, and it could limit the efficiency development of their activities, while the number of volunteers has a positive effect in management efficiency because they represent the human resource capacity to contribute to the organisation to develop their activity in a cooperative and altruistic way, without receiving any payment, so it is a resource for the organisation but it is not a cost. The above statement suggests that an appropriate way of acting, among others, consists in implementing strategies to attract volunteer staff and ensure their satisfaction to preserve them, since it is evident that volunteers play an important role in the level of the efficiency of care and educational–cultural foundations.

In addition, the study shows that in the case of care foundations there are other significant variables mentioned below. Thus, antiquity, surplus and size of governing structure present negative coefficients, revealing that the increase of the number of years since the establishment of the foundation and the increase of the surplus or the

size of the governing body, decreases the probability of the company to be classified as efficient.

In the case of the antiquity, the negative coefficient is probably pointing out the inability of the oldest care foundations to adapt to changing situations, assuming the same professionalism as the younger ones, while the negative relationship between the size of governing structure and the efficiency can be caused by the difficulties in communication, coordination and decisions-making that are brought with the presence of a large body of government. Whit regard to the negative coefficient for the variable surplus, this situation could be explained by an excessive level of savings that prevent the organisation from performing the expenses that are necessary for a proper development of its activity. Also, in the same line, the explanation of the positive coefficient of the foundation endowment could be justified by its contribution to the financial strength of the institution, allowing, at the same time, to obtain the confidence of society and to increase their financing capacity necessary for achieving the general purposes of the organisation.

In summary, the conclusions of this empirical study could provide guidance to the managers of the foundations for an appropriate resource allocation to improve efficiency. In this sense, it should establish pathways and strategies for each kind of foundation, whose aim it would be to increase the efficiency in the achievement of social goals. However, there is a strategy common to both kind of foundations relative to the human resources, probably because their structure is composed of paid staff and volunteers, and it is very similar in both kinds of foundations. For this, it would be advisable to study the restructuration and organisation of the human resources, by establishing staff management policies based on implementing strategies to attract volunteers and ensure their satisfaction, and at the same to reduce the paid staff.

In addition, we present more strategies focused on each kind of foundation studied. On the one hand, in educational–cultural foundations, which according to our studies present a better performance capacity by nature but worse management efficiency, should pay attention to the assets management, because these kind of organisations have a great heritage, and probably they are not exploiting the assets in the most efficiency way. On the other hand, care foundations, which present a worse performance capacity by nature but better management efficiency, and therefore, they could apply different strategies to improve their efficiency such as redirecting the management of budgets towards the investment in general interest objectives, increasing the foundational endowment to raise the capacity to act of these entities, and adopting business management tools to be able to suit the needs of professionalism, together with the reducing of the government size to facilitate the efficient management of the organisation. The strategies presented could be a good decisions package to improve efficiency in resource management for the two different kind of organisations studied in the achievement of social interest goals.

The main limitation of the present research is the reduced time frame examined (triennium 2008–2010), and therefore the results should be considered with caution. For this reason, as future lines of research, we consider the following: the study of the human capital management in foundations, the development of the tools for evaluating the quality and permanence of volunteers in foundations, and other similar studies of

efficiency in resource management, but with a greater temporal dimension, in both: care foundations field and educational–cultural foundations, as well as in other sectors of the NPO activity, and even distinguishing geographical areas and countries.

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